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To broaden the application of thermoelectric generators (TEG) for waste heat recovery, low priced and environmentally friendly materials and cost-effective scalable manufacturing processes are needed. Dispenser printing method represents a promising technology for the manufacturing of TEG. The process generates 2D and 3D structures or multilayers with a high material utilization.

Several designs of printed TEGs were developed and evaluated. Beneath two vertical designs also the printing of p-type and n-type thermoelectric material into a non-woven substrate was studied. This enables the manufacturing of flexible TEGs in a continuous, automated process.

Polymers are used as thermoelectric material. The intrinsic conducting polymers PEDOT:PSS and PEDOT:tos are typical p-type materials. Beneath the low thermal conductivity, PEDOT has several advantages, such as its high electrical conductivity, good environmental stability and flexibility. Both were modified to increase the Seebeck coefficient, the electrical conductivity, and hence the power factor of the material. PEDOT:tos was synthetized under defined conditions and annealed to optimize the electrical conductivity and Seebeck coefficient. Poly[K_x(Ni-ett)] was synthesized and deployed as n-type polymer.

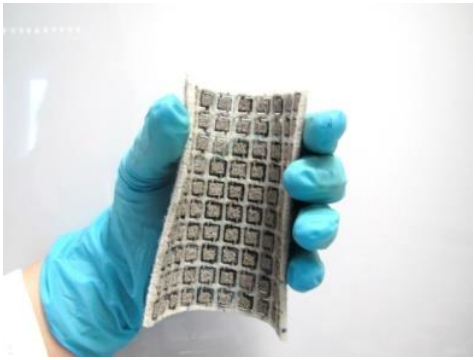

Figure 1. Dispenser printed flexible TEG on non-woven substrate